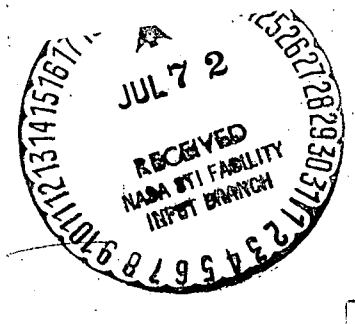
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

DRAFT

ENVIRONMENTAL STATEMENT

FOR

NIMBUS PROGRAM



March 1971

ENVIRONMENTAL IMPACT STATEMENT

NIMBUS PROGRAM

1. Program Objectives and Description

The Nimbus program, as appropriate to its pre-eminent role in meteorological satellite research and development, has as its name, the Latin word for cloud. The word "Nimbus" is now usually applied to rain clouds by meteorologists. The name was chosen by NASA Headquarters at the official initiation of the effort in August 1959.

The objectives of this project are to develop a significantly improved meteorological satellite to provide data on atmospheric parameters for use by the scientific community; to carry out flight tests to prove the applicability of the instrumentation; to fulfill special data requirements of the atmospheric sciences research community which can be provided uniquely by this instrumentation functioning as a space meteorological observatory; and to provide the basis for further significant technological advances in meteorological satellites for operational as well as scientific uses. These objectives will be extended in the Nimbus E and F missions to develop an applications observatory in polar orbit at low-to-medium altitude that will flight test technology and experiments for meteorology and other applications disciplines.

The project includes development, launch, and operation of a series of satellites exhibiting evolutionary advances in operating characteristics, and testing in orbit of sophisticated experiments for atmospheric research and operational demonstration. The satellite serves as a flexible space observatory on which a variety of advanced concepts for measuring atmospheric parameters can be tested. The satellite consists of three major subsystems: power, stabilization, and a sensory ring which can accommodate a number of sensors.

The first two spacecraft in the planned series of seven Nimbus satellites were Nimbus 1, launched on August 28, 1964, and Nimbus 2, launched on May 15, 1966. Nimbus B, a third spacecraft, launched May 18, 1968, was lost due to a launch vehicle failure. In June 1968, NASA approved launch of a replacement spacecraft which largely used flight spares or updated prototype subsystems and experiments. This mission, identical to the Nimbus B configuration, was designated B-2 prior to launch. It was successfully launched April 14, 1969, whereupon it was designated Nimbus 3. This replacement was necessary in order not to delay the flight test of that group of selected experiments and technological advances vital to the meteorological research and development program and required for long-range weather forecasting. The successful measurement from the Nimbus 3 of temperatures in the atmosphere has been termed "as significant to the advancement of meteorology as the launching of the first satellite."

Nimbus D was successfully launched on April 8, 1970, and designated Nimbus 4.

The Nimbus 1 through 4 spacecraft were all launched by the Thor Agena vehicles.

The additional approved missions in the Nimbus series are Nimbus E and F, planned for launch in the third quarter of calendar year 1972 and 1973, respectively. These missions will test new infrared radiometric and spectrometric and microwave instrumentation designed to allow determination of the vertical structure of the atmosphere in cloudy areas. Current instrumentation requires a reasonably cloud-free viewing area.

These and other new instruments will extend sounding of the atmosphere to new areas of the electromagnetic spectrum and to higher altitudes in the atmosphere.

2. Probable Total Impact of the Program on the Environment

Proven spacecraft and launch vehicle hardware and techniques have been studied and analyzed in the light of the Agency's and Nation's extensive experience in space flight. On this basis, the assessment has been made that there has been and will be no significant adverse impact on the environment as a result of the Nimbus Program.

Atmosphere: The direct adverse impact on the environment by the Nimbus E and F missions is almost entirely limited to that caused by the launch vehicle. No evidence has shown any significant lasting impact for frequencies of launch in the foreseeable future. This includes tropospheric, stratospheric and ionospheric pollution or disturbance as well as the return of the spent vehicles either into the sea or burning up during re-entry.

The launch vehicles currently used by NASA for automated science and applications missions range in size from the Scout to the Titan IIIC. The propellant combinations used in their stages include solids, LOX/Hydrogen, LOX/RP-1, IRFNA/UDMH, and $N_2H_4/UDMH/N_2O_4$. A total of approximately 20 of these vehicles are launched annually from four launch sites: Wallops Island, Virginia; Western Test Range, California; Cape Kennedy, Florida; and the San Marco Platform in the Indian Ocean off Kenya.

These small and medium class launch vehicles are considerably smaller than the Saturn class, which is discussed in the Apollo Program Environmental Statement and it is concluded that no detrimental environmental impact results from these launches.

The Nimbus E and F missions will be placed in a polar orbit in 1972 and 1973 from the Western Test Range launch site at Vandenberg Air Force Base, California, utilizing the Delta launch vehicle.

3. Alternatives to the Proposed Action

Obtaining by conventional surface or airborne observing stations and radiosondes meteorological measurements comparable to those obtained globally by the Nimbus Program has been shown by studies to be prohibitively costly. It would involve daily data gathering from the most remote and climatologically hostile regions of the world, including the open ocean. The logistic problems make such alternatives impractical.

4. Relationship between Short-Term Uses of the Environment and Enhancement of Long-Term Productivity

It is expected that local short-term use of the environment in this program will contribute to the enhancement of long-term productivity. This will be the result of using the knowledge which will be obtained to better adapt the activities of man to the natural dynamics and climatic changes of the environment.

5. Irreversible/Irretrievable Commitments of Natural Resources

No depletion of natural resources will result from the Nimbus Program.

6. Benefits

The beneficial effects of Nimbus E and F with regard to the environment are planned to be substantial and lasting. The basic aim of both missions is to contribute to basic techniques required to improve the accuracy of long-range weather forecasting. The infrared and microwave mappers and sounders (for obtaining vertical profiles of atmospheric parameters) will provide data required to implement the numerical models of the atmosphere. Thus, the data will provide for monitoring the state of the atmosphere and for forecasting its future state and determining the dynamics of the changes in it. These data are therefore very important to monitoring the flow of pollutants in the atmosphere.

Nimbus E also includes sensors which provide data on the ice and water content of clouds, areas of precipitation, morphology of ice cover, vegetation amounts, and water content of soil.

Nimbus F, in addition to the sounders and mappers mentioned above, also includes a system which can locate and collect data from in situ platforms measuring any parameters which the sensors are designed for. Obviously, air or water pollution sensors could be accommodated. Another experiment provides data vital to understanding climate variations. This understanding underlies the correct assessment of the long-term effects of pollution.

The Nimbus F sensors also will extend sounding into the stratosphere, providing a first continuing global assessment of that region. Vital data for modeling the structure and dynamics of the ionosphere will also be obtained.